

# HW7 Report

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## Part I

### 1. When h1 ping h2, what will happen?

The screenshot shows a Mininet network simulation with two hosts, h1 and h2. The terminal for h1 shows the following traffic:

```
root@h1:~# tcpdump -i eth0 -n icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
18:59:56.714545 ARP, Request who-has 10.0.0.2 tell 10.0.0.1, length 28
18:59:56.717240 ARP, Reply 10.0.0.2 is-at c8:3c:6a:fe:a7:80 (oui Unknown), length 28
18:59:56.717280 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 7104, seq 1, length 64
18:59:56.718156 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 7104, seq 1, length 64
19:00:01.941091 ARP, Request who-has 10.0.0.1 tell 10.0.0.2, length 28
19:00:01.941107 ARP, Reply 10.0.0.1 is at 0a:17:72:41:a6:15 (oui Unknown), length 28
```

The terminal for h2 shows the following traffic:

```
root@h2:~# tcpdump -i eth0 -n icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
18:59:56.716545 ARP, Request who-has 10.0.0.2 tell 10.0.0.1, length 28
18:59:56.716555 ARP, Reply 10.0.0.2 is-at c8:3c:6a:fe:a7:80 (oui Unknown), length 28
18:59:56.718162 IP 10.0.0.1 > 10.0.0.2: ICMP echo request, id 7104, seq 1, length 64
18:59:56.718171 IP 10.0.0.2 > 10.0.0.1: ICMP echo reply, id 7104, seq 1, length 64
19:00:01.940557 ARP, Request who-has 10.0.0.1 tell 10.0.0.2, length 28
19:00:01.941104 ARP, Reply 10.0.0.1 is at 0a:17:72:41:a6:15 (oui Unknown), length 28
```

The Mininet CLI shows the following output:

```
mininet> xterm h1 h2
mininet> h1 ping h2 -c 1
PING 10.0.0.2 (10.0.0.2): 56(84) bytes of data:
64 bytes from 10.0.0.2: icmp_seq=1 ttl=64 time=3.67 ms
-- 10.0.0.2 ping statistics --
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 3.479/3.670/3.670/0.000 ms
```

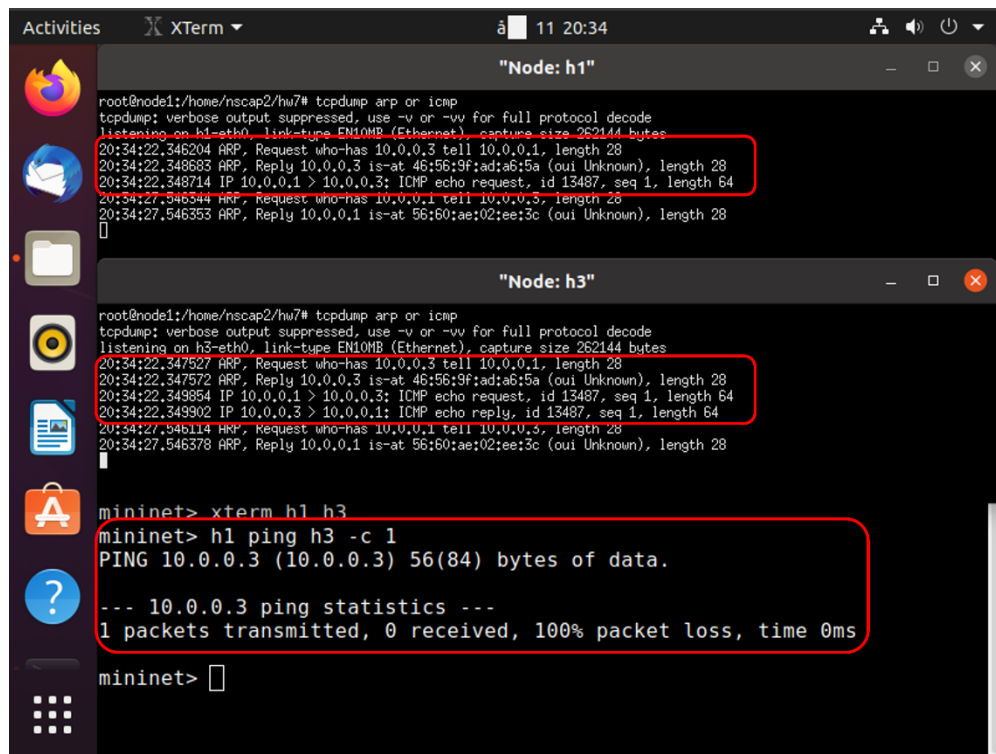
ARP :

h1 sent request  
h2 received and replied  
h1 received the reply

ICMP :

h1 sent request  
h2 received and replied  
h1 received the reply

2. When h1 ping h3, what will happen?



The screenshot shows a network simulation environment with three terminal windows. The top window, titled "Node: h1", displays a tcpdump capture of ARP and ICMP traffic. The second window, titled "Node: h3", shows a similar tcpdump capture. The bottom window, titled "mininet", shows the execution of a ping command from h1 to h3. Red boxes highlight the ARP request and ICMP echo request in the tcpdump outputs, and the ping command and its statistics in the mininet terminal.

```
root@node1:/home/nscap2/hw7# tcpdump arp or icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h1-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
20:34:22.346204 ARP, Request who-has 10.0.0.3 tell 10.0.0.1, length 28
20:34:22.348683 ARP, Reply 10.0.0.3 is-at 46:56:9f:ad:a6:5a (oui Unknown), length 28
20:34:22.348714 IP 10.0.0.1 > 10.0.0.3: ICMP echo request, id 13487, seq 1, length 64
20:34:27.546344 ARP, Request who-has 10.0.0.1 tell 10.0.0.3, length 28
20:34:27.546353 ARP, Reply 10.0.0.1 is-at 56:60:ae:02:ee:3c (oui Unknown), length 28

root@node1:/home/nscap2/hw7# tcpdump arp or icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h3-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
20:34:22.347527 ARP, Request who-has 10.0.0.3 tell 10.0.0.1, length 28
20:34:22.347572 ARP, Reply 10.0.0.3 is-at 46:56:9f:ad:a6:5a (oui Unknown), length 28
20:34:22.349854 IP 10.0.0.1 > 10.0.0.3: ICMP echo request, id 13487, seq 1, length 64
20:34:22.349902 IP 10.0.0.3 > 10.0.0.1: ICMP echo reply, id 13487, seq 1, length 64
20:34:27.546114 ARP, Request who-has 10.0.0.1 tell 10.0.0.3, length 28
20:34:27.546378 ARP, Reply 10.0.0.1 is-at 56:60:ae:02:ee:3c (oui Unknown), length 28

mininet> xterm h1 h3
mininet> h1 ping h3 -c 1
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.

--- 10.0.0.3 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms

mininet>
```

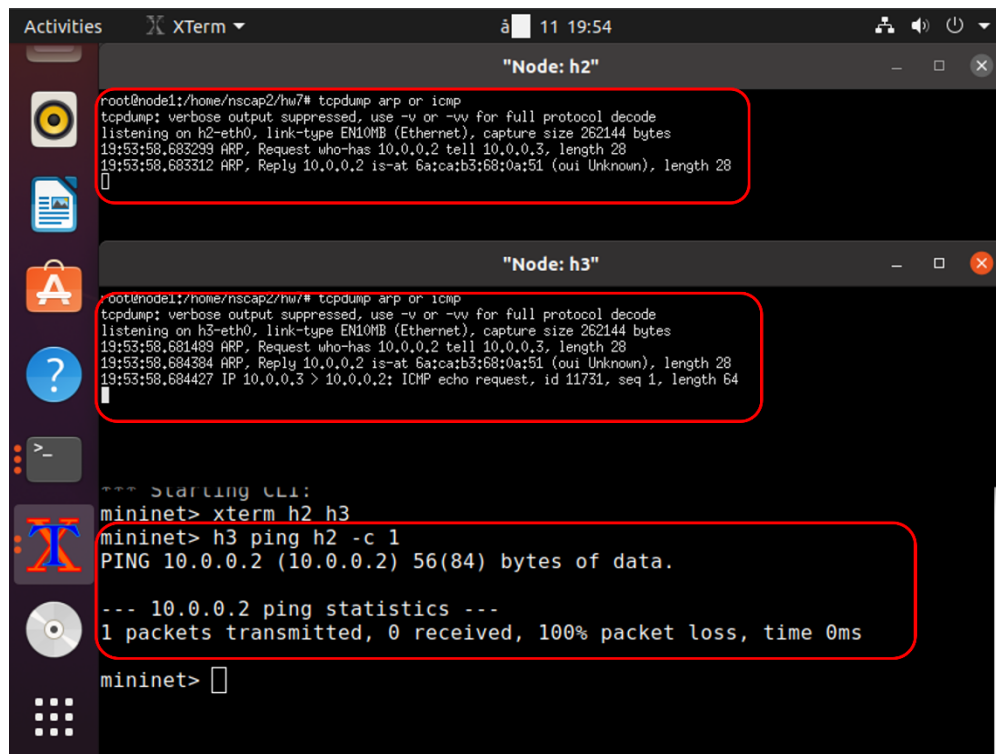
ARP :

h1 sent request  
h3 received and replied  
h1 received the reply

ICMP :

h1 sent request  
h3 received and replied

### 3. When h3 ping h2, what will happen?



The screenshot shows a network simulation environment with three terminal windows. The top window, titled "Node: h2", shows the output of a `tcpdump` command capturing ARP traffic. It displays an ARP request from 10.0.0.2 to 10.0.0.3 and a corresponding reply. The middle window, titled "Node: h3", shows a similar `tcpdump` output, capturing the ARP request and reply between the same IP addresses. The bottom window shows the Mininet CLI, where the user has started the CLI and executed `xterm h2 h3`. It then shows the execution of `h3 ping h2 -c 1`, which results in a 100% packet loss for the ping to 10.0.0.2.

```
root@node1:/home/nscap2/hw7# tcpdump arp or icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h2-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
19:53:58.683299 ARP, Request who-has 10.0.0.2 tell 10.0.0.3, length 28
19:53:58.683312 ARP, Reply 10.0.0.2 is-at 6a:ca:b3:68:0a:51 (oui Unknown), length 28
[]

root@node1:/home/nscap2/hw7# tcpdump arp or icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on h3-eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
19:53:58.681489 ARP, Request who-has 10.0.0.2 tell 10.0.0.3, length 28
19:53:58.684384 ARP, Reply 10.0.0.2 is-at 6a:ca:b3:68:0a:51 (oui Unknown), length 28
19:53:58.684427 IP 10.0.0.3 > 10.0.0.2: ICMP echo request, id 11731, seq 1, length 64
[]

*** Starting CLI:
mininet> xterm h2 h3
mininet> h3 ping h2 -c 1
PING 10.0.0.2 (10.0.0.2) 56(84) bytes of data.

--- 10.0.0.2 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms

mininet> []
```

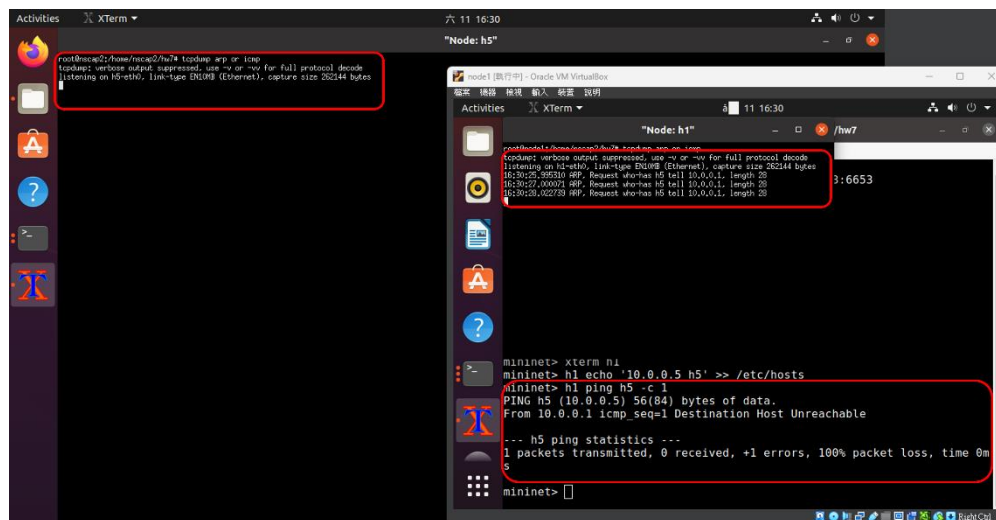
ARP :

h3 sent request  
h2 received and replied  
h3 received the reply

ICMP :

h3 sent request

#### 4. When h1 ping h5, what will happen?

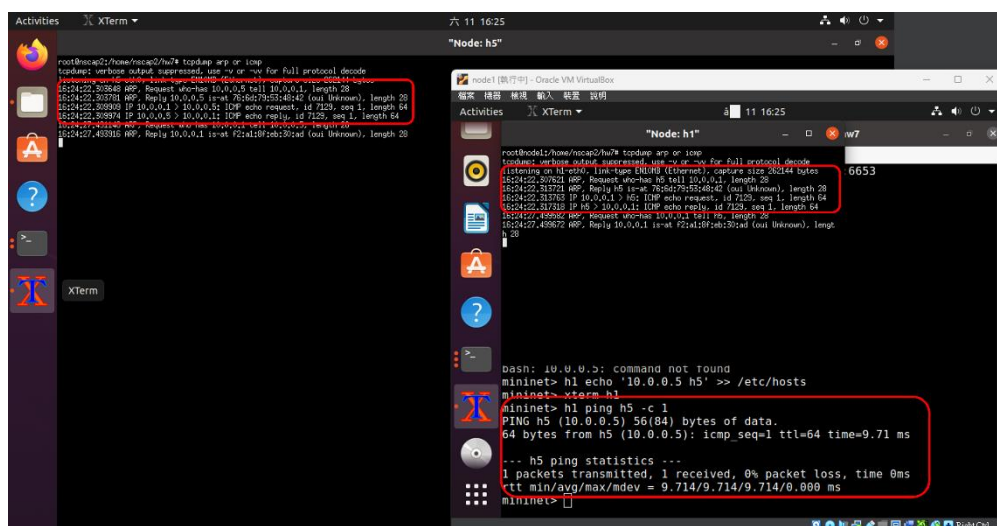


ARP :

h1 sent request \* 3 times

## Part II

#### 5. When h1 ping h5, what will happen?



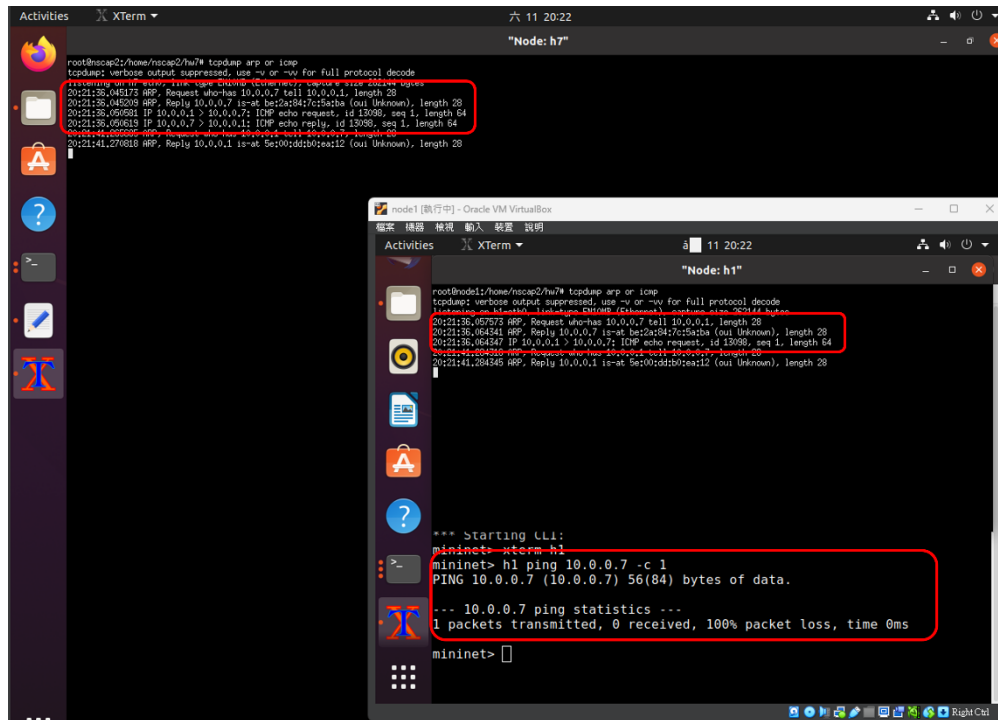
ARP :

h1 sent request  
h5 received and replied  
h1 received the reply

ICMP :

h1 sent request  
h5 received and replied  
h1 received the reply

6. When h1 ping h7, what will happen?



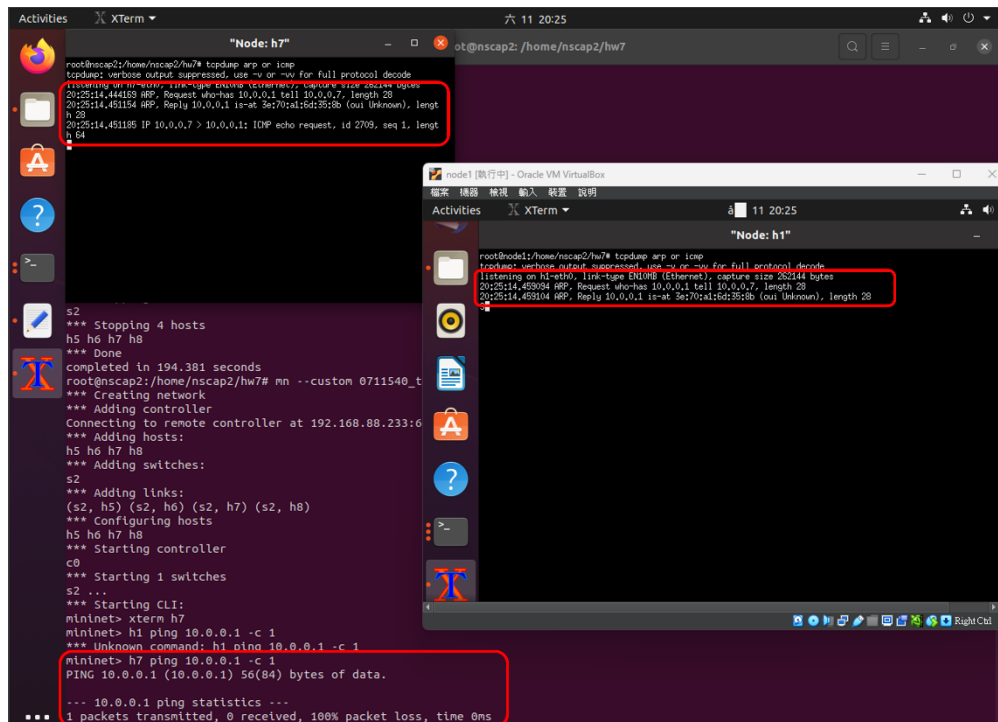
ARP :

h1 sent request  
h7 received and replied  
h1 received the reply

ICMP :

h1 sent request  
h7 received and replied

7. When h7 ping h1, what will happen?



The image contains two terminal screenshots. The left terminal, titled "Node: h7", shows the output of a tcpdump command capturing ICMP traffic. It displays an ARP request from 10.0.0.1 to 10.0.0.7 and a corresponding ARP reply. The right terminal, titled "Node: h1", shows the output of a tcpdump command capturing ICMP traffic, displaying an ARP request from 10.0.0.1 to 10.0.0.7 and a corresponding ARP reply. Below these, a third terminal window shows the output of a network setup script, including commands for creating a network, adding hosts, and starting a controller. The final output shows the results of a ping command from h7 to h1, indicating a 100% packet loss.

```
root@nscap2:/home/nscap2/hw7# tcpdump arp or icmp
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on eth0, link-type EN10MB (Ethernet), capture size 262144 bytes
20:25:14.444153 ARP, Request who-has 10.0.0.1 tell 10.0.0.7, length 28
20:25:14.451154 ARP, Reply 10.0.0.1 is-at 8e:70:a1:6d:35:b0 (oui Unknown), length 28
20:25:14.451185 IP 10.0.0.7 > 10.0.0.1: ICMP echo request, id 2709, seq 1, length 64

root@nscap2:/home/nscap2/hw7# mn --custom 0711540.t
*** Creating network
*** Adding controller
Connecting to remote controller at 192.168.88.233:6
*** Adding hosts:
h5 h6 h7 h8
*** Adding switches:
s2
*** Adding links:
(s2, h5) (s2, h6) (s2, h7) (s2, h8)
*** Configuring hosts
h5 h6 h7 h8
*** Starting controller
c0
*** Starting 1 switches
s2 ...
*** Starting CLI:
mininet> xterm h7
mininet> h1 ping 10.0.0.1 -c 1
*** Unknown command: h1 ping 10.0.0.1 -c 1
mininet> h7 ping 10.0.0.1 -c 1
PING 10.0.0.1 (10.0.0.1) 56(84) bytes of data:
--- 10.0.0.1 ping statistics ---
1 packets transmitted, 0 received, 100% packet loss, time 0ms
```

ARP :

h7 sent request  
h1 received and replied  
h7 received the reply

ICMP :

h7 sent request

8. If the packet in question 6 or 7 is dropped in some part of the network, are the outcome and explanation the same as that of question 4? (use screenshot to prove)

ANS : (同 Q4、6、7 圖) Q6、7(ping)失敗是因為 switch 2 將 h7 的 icmp request(or reply)丟棄；而 Q4(ping)失敗的原因是 ARP 協議找不到目標 host，兩個失敗原因是不同的。

## 9. Change filter\_table2 rule

- From: packets coming from port\_3 or port\_4 will be dropped, while other packets will be allowed to pass.  
To: packets coming from port\_1 or port\_2 will be allowed to pass, while other packets will be dropped.
- Will the outcome of questions 5, 6, and 7 differ? (no need to print screenshot), explain why or why not.

ANS :

For Q5 :

不同，由於 icmp request 將由 switch 2 送往 h5 時會觸發 filter2 規則，此封包將被丟棄。

For Q6 :

相同，一樣都是 h7 發送 icmp reply 時被 switch 2 丟棄該封包。

For Q7 :

相同，一樣都是 h7 發送 icmp request 時被 switch 2 丟棄該封包。